Independent Assurance Program 2014 Annual Overview

Sampling and Testing Statistical Analysis

2014 Summary of IAP Aggregate Sample Testing

- **178 Tests reported for Base/PCC Aggregates**
  - ✓ Included all sizes of Base Aggregates, fine, #1 & #2 PCC Aggr., Granular Backfills and MSE Wall Backfills
  - ✓ Split samples and sampling observations only included

2014 Summary of IAP Aggregate Split Sample Testing

- **10 Splits reported out of correlation tolerance**

2013 Summary of IAP Aggregate Split Sample Testing

- **92 Tests reported for Base/PCC Aggregates**
  - ✓ 54- CABC test splits
  - ✓ 38 CABC sample observations
  - ✓ 17- PCC No.1 tests(includes “shilstone types”)
  - ✓ 13- PCC No. 2 tests
  - ✓ 27 - PCC Fine tests

2013 Summary of IAP Aggregate Split Sample Testing

- **8 Splits reported out of correlation tolerance**

2005-2013 Summary of IAP Aggregate Split Sample Testing

Program Year	2005	2006	2007	2008	2009	2010	2011	2012	2013
Split tests Reported	219	225	191	120	102	147	138	153	111
Out of correlation splits reported	26	30	16	18	7	12	18	15	8
Percent out of correlation	11.9%	13.3%	8.4%	15.0%	7%	8%	13 %	9.8 %	7.2%

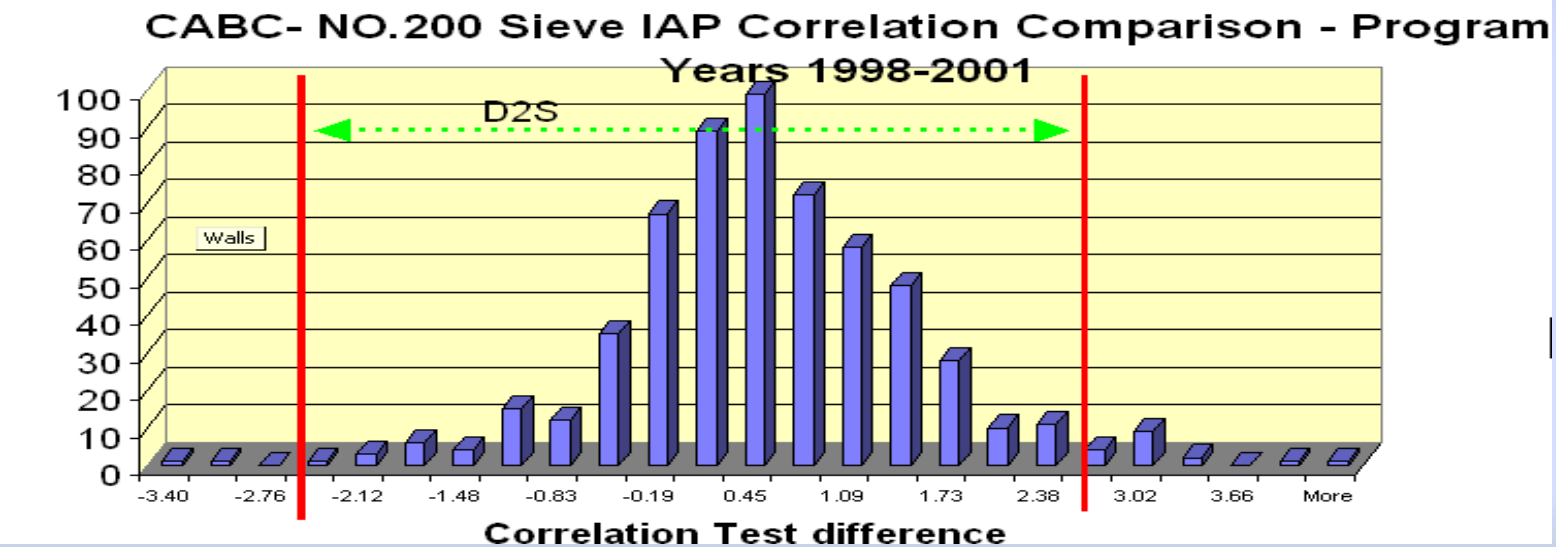
2013 Summary of IAP 801 Aggregate Testing Exceptions

Test ID 801	Group/Seq	Item Description	Count
	1-2	Correct random sample selection methods used (CMM 8.30)?	1
	5-3	Increments taken full depth of the layer, using squared nosed shovel?	1
	7-1	Splitter is of correct size and suitable for use?	2
	7-3	Material is placed in a pan or hopper and uniformly spread?	1
	8-1	Material placed on clean, hard, level surface or canvas?	1
	8-2	Sample is thoroughly mixed (turn over entire sample at least three times)?	1
	8-3	Deposited into a conical pile?	1
	8-4	Pile flattened down with a shovel to a uniform thickness (T) and diameter (D) - D = 4 to 8 T ?	1
	8-5	Flattened mass separated into 4 equal quarter, separated with a trowel or shovel?	1
	8-6	Remove opposite diagonal corners, including all fines?	1
	8-7	Continue to mix and quarter remaining material until sample is reduced to the desired size?	1
	11-3	Mechanical sieve shaker(s) meet adequacy of sieving requirements ?	1
	12-2	Lab test sample is proper size (CMM 8.60) ?	2
	12-7	Material finer than #4(P4) reducd in size using riffle splitter (CMM 8.60, T-248)?	2
	12-10	Individual sieves are not overloaded (AASHTO T-27 Table 1 CMM 8.60) ?	1

Difference Two-Sigma Limit (D2S Limit)

The D2S method compares the contractor and department results from a single split sample. The D2S Limit indicates the maximum acceptable difference between two test results obtained on test portions of the same material (and thus, applies only to split samples), and it is provided for single and multi-laboratory situations. It represents the difference between two individual test results that has approximately a five percent chance of being exceeded if the tests are actually from the same population. The value provided by this procedure is contained in many AASHTO and American Society of Testing and Materials (ASTM) test procedures and is typically listed in the precision and bias statement as "Acceptable Range of Two Test Results" at the end of each test procedure.

The D2S number is equal to 2.83 times the standard deviation; for example:



1998-2013 Summary of IAP Aggregate Split Sample Testing

Crushed Aggregate Base Course Statistics, Independent Assurance Program Split Sample Correlation Results

The below statistics are based on the absolute differences between the IA and the corresponding QC, QV, or QA sieve analysis test results. The D2S number is equal to 2.83 times the standard deviation.

Sieve Size	98-2003 D2S	98-2004 D2S	98-2005 D2S	98-2006 D2S	98-2007 D2S	98-2008 D2S	98-2009 D2S	1998-2010 D2S	1998-2011 D2S	1998-2012 D2S	1998-2013 D2S	IAP Tolerances +/- *
¾"	4.60	4.34	4.71	4.64	4.72	4.80	4.80	4.79	4.82	4.89	4.89	5.0
3/8"`	7.43	7.16	7.18	7.12	6.97	7.01	6.99	6.89	6.85	6.90	6.91	7.0
#4	6.13	6.0	6.0	6.01	5.80	5.84	5.79	5.74	5.74	5.82	5.85	5.0
#10	5.33	5.34	5.31	5.27	5.26	5.28	5.28	5.23	5.24	5.33	5.33	5.0
#40	4.19	4.06	4.12	4.15	4.15	4.21	4.21	4.14	4.12	4.22	4.25	4.0
#200	2.32	2.28	2.31	2.34	2.37	2.40	2.40	2.39	2.40	2.47	2.51	2.0

SAMPLE CORRELATION COMPARISON RESULTS

Aggregate type and grade: ---------- Correlation Tolerances +/- ----------

PCC:	6.0	6.0	6.0	6.0	6.0	6.0	5.0	4.0	4.0	4.0	4.0	4.0	3.0	2.0	1.5
Base:	6.0	6.0	6.0	6.0	6.0	6.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0	2.0

---------- Sieve Percent by Weight Passing ----------

	1.5	1.25	1	3/4	1/2	3/8	# 4	# 8	# 10	# 16	# 30	# 40	# 50	# 100	# 200
IA		100.0	94.3	79.8		50.9	34.5		24.0			17.1			9.0
QC		98.4	92.7	78.9		49.9	33.9		23.4			16.7			8.2
		1.6	1.6	0.9		1.0	0.6		0.6			0.4			0.8

1998-2013 Summary of IAP Aggregate Split Sample Testing

PCC SIZE #2 AGGREGATE CORRELATION STATISTICS, INDEPENDENT ASSURANCE PROGRAM SPLIT SAMPLE RESULTS

The below statistics are based on the absolute differences between the IA and the corresponding QC, QV, or QA sieve analysis test results The D2S number is equal to 2.83 times the standard deviation (Sn).

Sieve Size	98-2003 D2S	98-2004 D2S	98-2005 D2S	98-2006 D2S	98-2007 D2S	98-2008 D2S	98-2009 D2S	98-2010 D2S	98-2011 D2S	98-2012 D2S	98-2013 D2S	IAP Tolerances +/-
1.5”	4.62	5.12	5.35	5.35	5.40	5.36	5.39	5.46	5.46	5.64	5.60	6.0
1”	11.20	11.51	11.83	11.58	11.74	11.81	11.72	11.65	11.65	11.77	11.74	6.0
¾”	4.61	4.59	4.97	4.67	4.54	4.56	4.54	4.63	4.73	4.80	4.77	6.0
3/8”	2.33	1.31	2.18	1.47	1.47	1.51	1.49	1.59	1.46	1.95	1.93	6.0
#200	0.92	0.95	0.96	0.99	0.97	0.96	0.97	0.99	0.97	0.98	0.98	1.5

1998-2013 Summary of IAP Aggregate Split Sample Testing

PCC SIZE #1 AGGREGATE CORRELATION STATISTICS, INDEPENDENT ASSURANCE PROGRAM SPLIT SAMPLE RESULTS

The below statistics are based on the absolute differences between the IA and the corresponding QC, QV, or QA sieve analysis test results. The D2S number is equal to 2.83 times the standard deviation (Sn)

Sieve Size	98-2004 D2S	98-2005 D2S	98-2006 D2S	98-2007 D2S	98-2008 D2S	98-2009 D2S	98-2010 D2S	98-2011 D2S	98-2012 D2S	98-2013 D2S	IAP Tolerances +/-
¾"	4.71	4.70	4.67	4.74	4.57	4.58	4.53	4.48	4.64	4.64	6.0
3/8"`	6.96	6.99	6.85	6.88	6.89	6.99	7.02	7.03	7.13	7.17	7.0
#4	2.15	2.15	2.15	2.12	2.21	2.26	2.26	2.15	2.17	2.18	5.0
#8	1.26	1.40	1.40	1.35	1.38	1.43	1.43	1.35	1.37	1.38	4.0
#200	0.95	0.97	1.00	1.01	1.04	1.06	1.06	1.02	1.06	1.07	1.5

1998-2013 Summary of IAP Aggregate Split Sample Testing

PCC FINE AGGREGATE CORRELATION STATISTICS, INDEPENDENT ASSURANCE PROGRAM SPLIT SAMPLE RESULTS

The below statistics are based on the absolute differences between the IA and the corresponding QC, QV, or QA sieve analysis test results The D2S number is equal to 2.83 times the standard deviation.

Sieve Size	98-2001 D2S	98-2002 D2S	98-2003 D2S	98-2004 D2S	98-2005 D2S	98-2006 D2S	98-2008 D2S	98-2010 D2S	98-2011 D2S	98-2012 D2S	98-2013 D2S	IAP Tolerances +/-
#4	2.33	2.26	1.99	1.60	1.66	1.57	1.50	1.46	1.44	1.44	1.51	2.0
#16	4.04	3.73	3.70	3.38	3.56	3.37	3.33	3.28	3.27	3.24	3.23	4.0
#50	3.78	3.71	3.38	3.29	3.28	3.24	3.33	3.29	3.27	3.29	3.38	3.0
#100	1.82	1.82	1.65	1.55	1.57	1.56	1.56	1.62	1.60	1.58	1.57	2.0
#200	1.35	1.33	1.29	1.17	1.11	1.12	1.11	1.22	1.18	1.17	1.17	1.5

2014 Summary of IAP HMA Mix Testing

- **82 split tests reported**
  - ✓ **Gradation- 2 samples out of tolerance**
  - ✓ **Gmm – 3 sample out of tolerance**

2013 Summary of IAP HMA Mix Testing

- **67 split tests reported**
  - ✓ **Gradation- 2 samples out of tolerance**
  - ✓ **Gmm – 1 sample out of tolerance**
  - ✓ **Gmb – 0 samples out of tolerance**

2006-2013 Summary of IAP HMA Mix Testing

Program Year	2006	2007	2008	2009	2010	2011	2012	2013
Split tests reported	57	52	58	62	82	60	68	67
Out of correlation splits reported	9	9	4	10	13	4	10	3
Percent out of correlation	15.8%	17.3%	7.0%	16.1%	15.9%	6.7%	14.7 %	4.5 %

2013 Summary of IAP 804 HMA Mix Testing Exceptions

Test ID 804	Group/Seq	Item Description	Count
	1-1	Sample is large enough based on the nominal maximum aggregate particle size (NMAS)?	1
	2-8	Opposite diagonal quarters are combined for retained and test sample portions?	1
	2-9	Alternate device (quartermaster) used for the initial two splits?	4
	2-10	Sample is further reduced to test sample portions per figure 4 and 5 of CMM 8.36?	1
	3-1	Vacuum hose opening in the cover is covered with a small piece of #200 wire mesh screen.	1
	4-1	Proper sample size (based on NMAS) is used per CMM 8.36, figure 5.	1
	5-1	Capable and calibrated to apply an angle of 1.25 +/- 0.02 degrees.	1
	6-2	Test Sample portions correctly split out per CMM 8.36,figure 4.	1
	6-12	Compacted specimen extruded, papers removed, labeled and cooled for 1 hr 45 min (not to exceed 2hr)	1
	10-1	Sample is from test sample portions per figure 4 of CMM 8.36.	1

1998-2013 Summary of IAP HMA Mix Testing

HMA CORRELATION STATISTICS, INDEPENDENT ASSURANCE PROGRAM SPLIT SAMPLE RESULTS

The below statistics are based on the absolute differences between the IA and the corresponding QC, QV, or QA test results The D2S number is equal to 2.83 times the standard deviation.

Sieve Analysis

Sieve Size	98-2002 D2S	98-2003 D2S	98-2004 D2S	98-2005 D2S	98-2006 D2S	98-2007 D2S	98-2008 D2S	98-2009 D2S	98-2010 D2S	98-2011 D2S	98-2012 D2S	98-2013 D2S	IAP Tolerances +/-
3/8”	6.29	6.39	6.34	6.39	6.55	6.56	6.60	6.61	6.60	6.58	6.53	6.57	6.0
#8	6.18	5.59	5.55	5.62	5.68	5.73	5.73	5.72	5.74	5.64	5.57	5.57	4.0
#30	3.43	3.46	3.47	3.48	3.48	3.50	3.51	3.57	3.55	3.49	3.47	3.52	3.5
#200	1.82	1.68	1.68	1.69	1.72	1.73	1.74	1.78	1.80	1.79	1.82	1.82	2.0

Mix Property	98-2006 D2S	2002-2005 D2S	98-2008 D2S	2002-2007 D2S	2002-2008 D2S	2002-2009 D2S	2002-2010 D2S	2002-2011 D2S	2002-2012 D2S	2002-2013 D2S	IAP Tolerances +/-
Gmb	0.032	0.033	0.032	0.033	0.033	0.033	0.033	0.034	0.033	0.037	0.030
Gmm	0.030	0.034	0.030	0.033		0.033	0.030	0.028*	0.027*	0.027*	0.020

*Gmm D2S is for years 1998-2013

2014 Summary of IAP HMA Nuclear Density Testing

- **136 Test observations reported**
  - ✓ **7 Comparisons out of tolerance**

2013 Summary of IAP HMA Nuclear Density Testing

- **132 Test observations reported**
  - ✓ **130 split test comparisons**
  - ✓ **8 comparisons out of tolerance**

2006-2013 Summary of IAP HMA Nuclear Density Testing

Program Year	2006	2007	2008	2009	2010	2011	2012	2013
Observations reported	73	67	85	96	144	142	119	132
Split tests	60	42	66	83	129	130	113	130
Out of Correlation splits reported	6	5	10	11	13	15	10	8
Percent out of correlation	10%	11.9%	15.2%	13.3%	10.1%	11.5%	8.8%	6.2%

2013 Summary of IAP 803 Density Testing Exceptions

Test ID 803	Group/Seq	Item Description	Count
	1-0	Operator qualifications (CMM 8.15)	1
	1-1	Radiation safety training	1
	1-2	HTCP Certification (If required)	1
	1-3	Operator wearing a TLD (Thermo Luminescent Dosimeter) or Film Badge	5
	2-0	Apparatus	1
	2-1	Approved consultant gauge (calibration current ?)	1
	2-2	Base clean, accessories (air gap stand etc.) and operating parts in good condition / order	1
	2-3	Shipping containers, securing and locking devices appropriate and functional ?	1
	3-0	Testing Procedures (CMM 8.15)	1
	3-1	Gauge warmed up properly per manufacturer instructions ?	1
	3-2	Standard counts taken if applicable (5 ft any structure, 30 ft other radioactive sources)	1
	3-3	Standard counts recorded	1
	3-4	Density reference checks within 1.5 pcf of standard	1
	3-4	Moisture value within 0.5% of standard	1

2013 Summary of IAP 803 Density Testing Exceptions

3-4	Moisture value within 0.5% of standard	1
3-4	Proper forms used and data recorded	1
3-4	Reference block used or reference location used daily:	1
3-5	Correct gauge mode (asphalt / soils) selected	1
3-6	Test time total duration 4 minutes (120-120 Seaman gauges) set	1
3-7	Density target used is verified and set correctly	1
3-8	Test site location selected by approved random methods	1
3-9	Gauge is on flat surface (check opposite corners for rocking)	2
3-10	Long dimension of gauge parallel to edge of pavement	1
3-11	1 foot - pavement joints	1
3-11	1.5 feet - unrestricted edge pavement	1
3-11	15 feet - bystanders, vehicles, equipment, manholes etc.	1
3-11	3 feet - operator	1
3-11	30 feet - other nuclear devices	1
3-11	Correct minimum distances maintained from the center of the gauge:	1
3-12	Approved forms used and complete data recorded	1

2014 Summary of Fresh Concrete Mixture Testing

- **Totals of Independent Assurance Program reports for observation and comparisons of fresh concrete mixture sampling and testing recorded**

397 Observations and comparisons in 2014

2013 Summary of Fresh Concrete Mixture Testing

- **Totals of Independent Assurance Program reports for observation and comparisons of fresh concrete mixture sampling and testing recorded**

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
227	228	282	312	328	390	406	406	346	388

2013 Summary of Fresh Concrete Mixture Testing

- **Air Content Test Comparisons**
  - **117 comparisons reported**
  - **97.4% between 0 and 0.5%**
  - **3 comparisons exceeded 0.5%**
  - **1242 comparisons reported year between 2000-2013**

2013 Summary of Fresh Concrete Mixture Testing

- **Calibration Canister Field Checks**
  - **461 total reported**
  - **448 (97.2%) within 0%- 0.2%**
  - **13 checks reported over 0.2%**
  - **4254 cal-can checks recorded 2000 to 2013**
  - **4143 checks have met the 0.2% tolerance limit**

2013 Summary of Fresh Concrete Mixture Testing

Temperature of Fresh Concrete Mixtures

- **372 comparisons recorded**
- **353 (94.9%) within 2 degrees Fahrenheit**

2013 Summary of IAP 802 Fresh Concrete Sampling Testing Exceptions

Test ID	Group/Seq	Item Description	Count
802			
	1-1	Sample obtained correctly per CMM 8.70 / If QMP was proper random selection made ?	2
	1-3	Sample protected / covered ?	22
	1-5	Individual samples combined and re-mixed ?	8
	1-6	Sampling &mixing receptacle, clean, non-absorbent, large enough ?	2

2013 Summary of IAP 802 Slump Testing Exceptions

2-1	Apparatus and tools meet requirements ?	2
2-2	Cone clean and damp, on damp, rigid, level non-absorbing surface ?	8
2-3	Test started within 5 minutes of final sampling ?	10
2-4	Cone held firmly in place ?	5
2-5	Filled in three layers of equal volume ?	3
2-6	Each layer distributed uniformly with tamping rod then consolidated ?	8
2-7	Each layer rodded 25 times throughout its depth ?	6
2-8	2nd and 3rd layers rodded through depth and just into underlying layer ?	13
2-9	Layers rodded uniformly across surface ?	1
2-10	Rodding progressed from perimeter and spiraled toward center ?	4
2-11	Last layer kept heaping up above cone at all times during rodding ?	7
2-12	Cone struck off level with top ?	2
2-13	Concrete cleaned from around base of cone ?	6
2-15	Cone lifted without lateral or twisting motion ?	2
2-16	Time to lift cone (5 +/- 2 seconds) ?	5
2-18	Measured from original displaced center of the test specimen ?	2

2013 Summary of IAP 802 Pressure Meter Testing Exceptions

3-1	Apparatus and tools meet requirements ? (mallet 1.25 lbs. +/- .5 lb.)	15
3-2	Calibration records with the meter ?	4
3-3	Air bowl dampened and set on level rigid surface ?	4
3-5	Scoop or trowel moved around top of bowl edge when placing mix in bowl ?	6
3-7	Each layer rodded 25 times throughout its depth ?	6
3-8	Each layer distributed uniformly with tamping rod then consolidated ? (Recommended)	6
3-9	2nd and 3rd layers rodded through depth and just into underlying layer ?	7
3-10	Layers rodded uniformly across surface ?	1
3-11	Side of bowl tapped with mallet after rodding each layer ?	7
3-12	Bowl slightly overfilled on last layer and screeded off level ?	7
3-16	Meter jarred gently until all trapped air is expelled (no air bubbles come out) ?	13
3-17	Pumped air into chamber until gage hand past the initial pressure line ?	15
3-18	Hand stabilized at the initial pressure line - both petcocks open (tap gage gently) ?	8
3-19	Petcocks closed and main air valve opened / fully released ?	1
3-20	Side of bowl tapped smartly with mallet to relieve local restraints ?	17
3-21	Pressure gage tapped lightly and percentage of air read ?	3

2013 Summary of IAP 802 Concrete Cylinder Testing Exceptions

4-2	Molding of cylinders begun within 15 minutes of obtaining final composite sample ?	1
4-3	Scoop or trowel moved around top of mold edge when placing mix in mold ?	7
5-2	Each layer rodded 25 times throughout its depth ?	1
5-4	2nd and 3rd layers rodded through depth and just into underlying layer ?	2
5-5	Layers rodded uniformly across surface ?	2
5-6	Sides of mold tapped with mallet (after rodding each layer) to close voids ?	5
5-7	Mold slightly overfilled on last layer to fill mold after consolidation and screeded off level ?	3
6-3	Scoop or trowel moved around top of mold / bowl edge when placing mix in mold ?	3
6-5	Vibrator inserted in three different points in each layer (Two insertions for cylinders) ?	3
6-8	Sides of cylinder mold tapped with mallet (10-15 times) to close voids/ release trapped air bubbles?	4
6-9	On completion of vibration, if needed add only enough concrete (trowel) to overfill mold/bowl 1/8" ?	1
7-1	Cylinders are plainly marked and identified (No mark or disturb top cylinder surface) ?	3
7-3	Initial curing specimens protected from evaporation at top, kept at 60 - 80 degrees F ?	1
7-4	Lab cylinders kept in field - moist conditions, 60 - 80 degrees F for two additional days ?	1
7-5	Field cure temperature recorded by using a maximum - minimum thermometer ?	12

2013 Summary of IAP 802 Concrete Temperature Testing Exceptions

8-1	Thermometer accurate to +/- 1 degree F (+/- 0.5 C) suitable and calibrated ?	16
8-2	Device sensing part submerged in mix minimum of 3 inches ?	7
8-3	Mix pressed around device at surface of the concrete ?	5
8-4	Device left in place minimum of two minutes or until reading stable ?	2
8-5	Measurement completed within 5 minutes of obtaining sample ?	17

2013 Summary of IAP 802 Concrete Thickness Probing Exceptions

50-1	Minimum 80 square inches (Min 10 inch diameter or 9inch x 9 inch)	1
50-1	Proper height over the fresh concrete to allow easy use of the probing device	1
50-1	Safely supports a person	1
50-1	Sufficiently rigid to be plane within 1/8 inch of the concrete surface	3
50-1	Thickness and rigidity sufficient to not flex under probing rod	1

2014 Summary of IAP 805 Soils Nuclear Density

28 Observations
or split tests

2014 Summary of IAP 806 Concrete Cylinder Lab Reviews

A total of **17** Concrete Cylinder Lab Observations were reported

Other Issues?